

10th Triple Helix Conference 2012

Building a triple helix corporation: organizational innovation for cross sector research collaboration in a catch-up region

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Abstract

This paper studies an organizational innovation to foster research collaboration in a peripheral region. It uses a case study of a public-private corporation promoted by the Regional Government of Andalusia (Spain) that put together different types of firms and university research groups. It focuses on the process of building a new partnership taking into account its organizational features and the perspectives of industry stakeholders. Three types of information have been collected: qualitative interviews with industry managers, internal information provided by the corporation, and the results of an impact assessment. The findings show that this arrangement may incubate cooperative R&D in a regional environments characterized by low absorptive capacities, lack of trust and a cultural gap between science and industry. The results also show some limits related to the organizational design, the research orientation of the activities and the regional scope. The case study is used for informing the discussion on Triple Helix organizations regarding their possibilities for engaging partners with different expectations.

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Selection and/or peer-review under responsibility of Institut Teknologi Bandung

Keywords: cross sector research collaboration; university-industry relationships; organizational innovation; peripheral regions.

1. Introduction

Research collaboration between universities and firms, and between firms themselves, is especially difficult in peripheral regions. Firstly, these regions share some features that hinder the possibilities that firms have for engaging with academic R&D, such as lack of agglomeration of firms in high-tech sectors, low industrial R&D

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investment and predominance of traditional SMEs. Moreover, their regional university systems have developed without close relationships with productive sectors. Universities often lack organizational arrangements and incentives for engaging with the firms they find in their close environment. Secondly, research collaboration between firms is also scarce. In addition to the low absorptive capacities of the industrial tissue, firms in peripheral regions have organizational characteristics that make R&D exchange difficult. Many big firms have their headquarters and R&D departments outside the region and do not look for local partners. It often happens that SMEs do not trust each other for exchanging information on innovation issues because they compete in the same markets. The shortage of business angels also mediate the capacity of local start-ups to engage in joint ventures. Therefore, in these regions organizational innovations have special importance for promoting collaboration and knowledge transfer.

An important issue in current literature and policy making is how to develop institutional and organizational arrangements specially designed to overcome the gaps above mentioned, in addition to more traditional tools as university TTOs, research parks, cooperative projects and tax incentives. Triple Helix (TH) organizations that put together firms and university researchers around relevant technologies have been largely investigated, especially the programs for cooperative research centres of some OECD countries. Nevertheless, we lack additional research on the varieties of organizational innovations specifically designed to promote industrial research through both university and governmental support in catch up regions.

This paper studies the dynamics of research collaboration through an organizational innovation specially designed for filling the gap between science and industry in a peripheral region. It is based on an extended case study of a public-private corporation (the Technological Corporation of Andalusia-CTA) promoted by the regional government, which integrates industries with different sizes and absorptive capacities. Firms participate in the corporation with an economic contribution that is complemented by the government with an equal amount of money. In exchange, firms have access to the resources of the corporation for developing collaborative research projects with universities. This Corporation can be considered as a strategic research site for observing TH dynamics. The case study is especially interesting for understanding the role of organizational innovations in contexts where has been difficult to get firms involved in processes of knowledge creation and exchange.

The aim of this paper is to examine the development of relationships between participating firms, including the process of establishing the corporation, the motives of a varied set of industry stakeholders, the conditions that make collaboration possible, and the pros and cons of organizational diversity.

The main research questions are the following:

- Why are the industry stakeholders interested in this type of corporation?
- What are the components of the process that facilitate collaboration and prevent competition?
- What are the results that the partners obtain? Is this corporation an effective tool for incubating more stable partnerships such as cooperative research centres?
- Would the collaboration be sustainable and economically viable without the public support?

As a theoretical perspective, we combine the TH perspective with developments on organizational innovation related to cooperative research. We concentrate on the process of building a new organization, especially the components that generate trust and social capital between partners, facilitating the sharing of tacit knowledge. We also look at these organizational arrangements that work as drawbacks for accommodating diversified goals. Three sources of information are used: original interviews with industry partners and managers, internal documents and annual reports, and the results of evaluations of project impact.

2. Background

Triple helix (TH) organizations can be understood as specific organizational arrangements established for facilitating collaboration between universities and industries, usually with the active participation of governmental bodies. TH organizations form a varied and versatile set of arrangements that are highly context-

dependent. They are structured in different ways and produce different results depending by national and regional contexts [1]. The most well-known experiences are the Cooperative Research Centres (CRC), formed with direct participation of firms and universities as autonomous units designed to carry out R&D close to industrial applications. They can be found in countries with strong and stable national or federal programmes, such as the USA [2] and Australia [3]. These centres tend to emerge in contexts where better conditions for filling the gap between research and industrial applications can be found, specially the presence of firms with strong absorptive capacities and leading research universities and public research organizations.

Nevertheless, the models mentioned above are not frequent in less developed innovation systems because of several reasons. In peripheral regions, and also in many developing countries, most of the R&D capacities are concentrated in the academic sector. The industrial tissue is characterized by the predominance of SMEs that work on low tech manufacturing and bigger industries that work on services or have their R&D activities in other countries. In addition, administrative and institutional structures do not provide enough incentives for both partners to be engaged in cooperative processes.

The structures usually found in these countries, especially in European peripheral regions, tend to approach to either the science or the innovation ends [4]. On the one hand, the so called “excellence centres” are closer to leading research. Although they may be formally oriented to industry, they are usually an extension of academic organizations, supported mainly with public funding and with little financial involvement from firms [5]. On the other hand, the growing networks of technology and innovation centres are oriented to solve the practical needs of firms located in their regional or local contexts. They are committed to firms’ productive processes, although they usually do not focus on leading research. They concentrate on technological upgrading and the innovation needs of SMEs [6]. Hybrid structures for research are much less frequent. Therefore, it is still both a policy and management objective to develop adequate structures for linking research with productive processes in catch-up innovation systems.

Some governments and industries are looking for organizational and institutional innovations that encourage applied and cooperative research activity, where firms and universities cross traditional boundaries and transfer technologies and capabilities. Some experiences look for organizational forms to overcome barriers in non R&D intensive contexts. Common features of these structures are shared with the most well-known CRC models, although they have distinctive characteristics. They involve other profile of firms, have distinct goals related to regional development, and show organizational traits that try to accommodate research and knowledge transfer for firms with different capabilities. These forms seem under studied and can provide more scope for understanding the rationale of organizational innovations in the field of TH studies.

The agenda of regional policies is driven by the creation of a system of innovation including institutions, research organizations, funding structures, interactive networks and forums for the pursuit of common economic goals. In this agenda, the regional environment is considered as relevant as the national macroeconomic situation in determining the abilities of enterprises to compete in national and global economies [7]. Specifically, the construction of intelligent organizational interfaces is a common strategy to leverage learning capabilities and the diffusion of knowledge among cooperating firms [8].

A main line of action of public policies is to try to overcome the cultural and structural gap by new interfaces that try to avoid the transaction cost derived from the difficulties of finding partners, and the risk of working with partners with different interests. A particular type of organizational innovation that has showed a positive impact on R&D activities is the network of innovators. Such networks can tackle the most common problems related with inter-organizational research cooperation that we noted above. For example, they may reduce the cultural gap among different institutional settings through the sharing of tacit knowledge. They may avoid transaction costs related with finding adequate partners, and cooperating with organizations aimed by divergent interests. They also may resolve problems such as lack of trust and competence between partners [9]. Therefore, social capital generated by affiliation in networks is recognized as a key factor that fosters both cooperative and innovative capabilities [10].

A second line of action of public policies is to try to generate or substitute the organizations that are considered to be present in the social structure of innovation. One of the components is the existence of firms with more absorptive capacities. In particular, governments try to improve the absorptive capacities of firms by providing funding for R&D related activities and by using regional universities as an input for leveraging the firms' research activities. The other component is the existence of an adequate flow of financial resources oriented toward innovative sectors through organizations like business angels and incubators.

An important issue is the effectiveness of the models implemented for accomplishing the goals above mentioned. It has been suggested that repeated interactions and flexible patterns of cooperation within networks foster the emergence of new clusters of innovation, which have a positive impact on the economic performance of a region [11]. However, it is not still clear which specific characteristics of a network have a positive impact on innovation capabilities of firms. For example, some studies observed that dense inter-organizational networks, centralized around few key firms, are more able to generate innovative outputs [12], while others gave attention to the knowledge arising from “structural holes” between the boundaries of established organizational settings [13].

Other studies have emphasized that in sectors characterized by increasing uncertainty firms tend to avoid direct competence through the building of networks and sectorial associations, which aim is maintaining control on competitors' activities, reducing uncertainty and then fostering effectiveness of firm's strategies [14] [15]. As a consequence, it is not still clear whether, from a firm's point of view, the building of a cooperative research network would be a strategy to tackle with the problems of inter-organizational collaboration, for example the lack of trust among partners, or a more short-viewed strategy motivated by an opportunistic aim of technology scouting. These strategies could have a diversified impact on the performance of cooperative research.

Finally, other studies have noted that not only network's characteristics affect organizational innovation for cooperative research. For example, the recently launched cooperative research centres program in North Ireland has showed that university-based R&D centres are more innovative in short-period but less sustainable in long-period, in opposition to company-based centres [16]. The predominance of academic partners or firms in the cooperative relationship can also lead to different results. It can be expected that in projects in which collaboration is leaded by private companies, research would be more limited in scope, but more sustainable during time and more according to firm's specific needs.

We have used the above brief discussion in order to prepare our research strategy for studying the case of The Technological Corporation of Andalusia (CTA), already mentioned. The result of this discussion have provided the guidelines to decide the information to be gathered in the field work and the aspects to be analysed in order to compare this case with other described in the literature.

3. Methodology

We have considered that the CTA experience can be studied with the approach of the case study, in particular with that of the “extended case method” that suggests to use it for moving from the micro to the macro level building on pre-existing theory [17]. Thus, a multi method procedure has been used for observing the following dimensions: the perspectives from different stakeholders, the process of research collaboration and the results. Three types of information have been collected: original qualitative interviews, internal information provided by the corporation, and statistical accounts of projects. From the above sources we have selected the topics that reflect industry perspectives.

Qualitative interviews. We have performed 6 original in-depth interviews with industry managers and owners of firms that are members of the CTA. These firms represent different absorptive capacities (small, medium-size and big firms) and different productive sectors (high-tech manufacturing, medium and low-tech manufacturing, and services). The selected firms reflect the three types of membership and also different forms of funding instruments used. Table 1 resumes the main characteristics of the firms.

Table 1. Characteristics of the firms interviewed

Firm	Size	Sector	Experience in R&D	Projects performed	Projects with other firms
A	Small	Biotechnology	High	6	3
B	Medium	Chemical and Environment Engineering	High	11	2
C	Large	Energy, New Materials, ICTs Engineering	Low	2	0
D	Medium	Construction	Low	10	3
E	Large	Construction, Energy	Medium	6	0
F	Medium	Banking	Medium	11	10

Interviews' duration was about an hour and half. A common template has been used for the interviews. The sections are the following: 1) situation of the firm regarding R&D and innovation, 2) rationale to engage in collaborative research, 3) reasons for joining the CTA, 3) expectations about the corporation, 4) dynamics of collaboration, including the specific use of the services, the participation in projects with other partners, obstacles and facilitating factors, 5) results obtained in terms of satisfaction and benefits perceived by the firm.

Internal information from the CTA. It includes annual reports, organizational charts and brochures. In addition, we have carried out a long in-depth interview with the Technical Director of CTA in order to get detailed information about the origins and evolution of the corporation, the relationships with the partners and the internal procedures.

Evaluation accounts. We have used aggregated statistical data on internal evaluation reports containing the results of a survey that uses funded projects as units of analysis. For this paper we have selected outcomes related to five dimensions: culture, strategy, management, benefits, relationships and corporate responsibility. The questionnaire has asked about outcomes perceived by the firms related to the above dimensions using Likert-type scales of 5 items. In addition, this evaluation contains input-output analysis and quantitative outputs of the project that provide useful insights about their impact on the regional economy.[†]

From the above data sources we have used a triangulation strategy in order to answer our initial research questions. For observing the industry stakeholders we have used mainly information from the interviews to firms and to CTA's Director, to illustrate specific reasons from different types of stakeholders. For observing barriers and facilitating factors for collaboration we have used parts of the interviews referred to firms' motivations. Finally, the results can be better captured by observing both the outputs of effective funding and the benefits declared by the firms. We have combined the results of the internal evaluation report with interviews to firms.

4. The case study: The Technological Corporation of Andalusia (CTA) as a strategic research locus

Our case study is a public-private partnership promoted by the Regional Government of Andalusia with the specific purpose of enhancing cooperative research between universities and firms. The rationale and features of this corporation are better understood in the context of the regional innovation system.

The region. Andalusia is located in the South of both Spain and Europe. The region has almost 9 million inhabitants and covers an area of 87,000 square km. It is geographically diverse, with large rural enclaves and several metropolitan areas. A traditionally less developed region, Andalusia has undergone a rapid process of

[†] The impact assessment of CTA projects is contained in an internal report available by demand (CTA, 2010). For this paper the sections related to quantitative results and input-output are used only to inform our analysis of organizational innovation for R&D partnerships.

change, bringing it practically on a par with European standards. In the early 20th century parameters on well-being were similar to those of the rest of the country. Nonetheless, the region differs from others in the country in terms of its lower competitiveness (73.5% of the per capita GDP of Spain) (CES, 2010). Andalusia can be considered to be a catch-up innovation system because of the lack of industrial agglomeration and innovative firms. Investment in R&D is low by international standards (1.5% of GDP). Only 33% of R&D expenditure of the region is incurred by business (INE, 2010). Important industrial sectors are aimed more towards local markets and dedicated to low- and medium-technology activities and services (CES, 2010). In the last decade new businesses have emerged as a result of economic integration into the European Union and policies for firm diversification and entrepreneurship (Junta de Andalucía, 2003). The region does contain emerging-technology industries, especially those in the energy, aeronautics and agro-food sectors, although the industrial tissue is formed mostly by service firms (OECD, 2011).

With regard to its public research system, Andalusia currently has nine public universities with some 250,000 students and 17,000 teaching and research staff, in addition to several public research organizations (PROs). The regional government controls funding and management of the higher education sector and an important part of science policy. The growth of the university system during the 1980s and 1990s led to the concentration in universities of a large part of regional R&D resources – universities account for 45% of R&D expenditure and 61% of researchers in the region are employed by universities (INE, 2010).

An important aspect of innovation policies has been the reorganization of governmental departments and higher education policies in order to use public research to improve firm innovation. Several economic incentives have been introduced to link firms with universities, including a network of university Technology Transfer Offices (TTO) and an extensive network of innovation support offices (CICE, 2006). Nevertheless, this innovation policy was considered as an example of the ‘linear model’, given the structural separation between sectors and the division of work for different forms of knowledge transfer (OECD, 2011). In recent years new structures have been established to provide closer collaboration between sectors as well as critical mass around technology fields in order to promote the emergence of radical innovations. The CTA is the main organizational innovation of this kind.

CTA rationale. The CTA was launched in 2004 by the Regional Government as a public-private consortium with the collaboration of several public and private partners. The board of trustees includes members of the Regional Government, the participating firms, and the universities and public research organizations of the region. Six main strategic sectors were established: energy, biotechnology, productive processes related to aerospace, tourism, construction and agro-food.[‡]

The main goal of the corporation is to get real engagement of companies in R&D through a new arrangement where private funding provided by each company is matched by the regional government. Participation is open to any firm wishing to adapt to the general goal and the strategic fields of enquiry. Firms apply freely to join. The board of trustees decides the acceptance as a member based on both the profile of the firm and the strategy for joining.

Budget. The budget is formed by fees paid by participating companies and public money. Members pay a subscription fee every four years. Fees are modulated by the size and capacities of the company. Currently there are three types of partners, each or them with a different fee. The so called “incorporated firms” are bigger firms. The fee is 1 million euro. “Collaborating firms” are medium sized firms. Their fee is 250.000 euro. “Associated firms” is the category for smaller businesses. Their fee is 60.000 euro.

[‡] The fields were decided having in mind some of the importance sectors of regional economy in terms of GDP (agro-food, tourism, construction), as well as other sectors considered strategic because the existence of dynamic clusters of firms (aerospace components, energy, biotechnology). Information can be found at <http://www.corporaciontecnologica.com>

An important feature of the budget is that the regional government matches the payment of each company. With this amount of money a fund is created to support cooperative R&D between the member firms, and between firms and university groups. The membership categories imply different level of participation in the governing bodies, although every firm has the same access to services and funding provided by the corporation on a competitive basis.

Activities. The two groups of activities provided by the CTA are services and funding of R&D projects. Services include training, search and negotiation between CTA partners in order to develop joint activities, intellectual property right issues, and technical and administrative help to get funding from external sources, both nationally and internationally. R&D projects are distributed through a competitive system of calls where only member companies receive funding up to 50% of the total cost of the project. Proposals are evaluated by external boards of referees having in mind the coherence of the arrangement and the R&D level. Projects are open for single firms and for group of firms, being the collaboration between firms one of the main criteria for funding.

An important feature regarding project funding is that participation of partners from universities is compulsory. Every project or consortium must dedicate at least 15% of the amount provided by the corporation to a university research group. The firms presenting the proposal have the freedom to choose any university group and negotiate the kind of participation in the project (for instance, the participation of a university team may consist of services, consultancy or collaborative research), although the added value of engaging university researchers needs to be justified.

Evolution of membership. The first arrangement of CTA in 2004 was established with 44 firms, most of them medium and big firms of Spain, including many of the main technology players of the region in addition to important service firms and banks. This decision was based mainly on the capacity of these firms to provide the initial funding. All of the founding firms were considered as “incorporated” and provided 1 million euro.

In the following years different kind of firms were accepted. This was not only a designed process, but rather a result of demands from other regional firms to join the corporation, most of them SMEs. Therefore, the other categories for smaller firms were created. At the moment the CTA is formed by 139 companies, including some of the major national and regional companies, banks, newer companies in competitive sectors, as well as many SMEs.

In addition, the firms in the CTA are able to interact freely between them without the intermediation of the corporation. The CTA is expected to function as both a cooperative promoter and an incubator of new cooperative research partnerships that are being created with their administrative and economic support.

5. Findings

5. 1. Why are industry stakeholders interested in this type of collaboration?

We have found two main reasons for joining the corporation. The first one is related to the aim of building a tissue of social networks. The specific motivations are the following:

- Improve reputation and visibility by participating in one of the region’s more prestigious R&D association
- Search for new customers and suppliers
- Search for new commercial and research partners
- Technology forecasting and technology vigilance over possible competitors in R&D related activities

From industry stakeholders’ point of view all these benefits are interrelated. Firms consider that improving their social capital is linked to both obtaining possible partners and access to new sources of information. They expect that this dynamic fosters new R&D and collaborative activities.

The above motivations are associated to bigger firms or SMEs that have an important technology component. For these firms there is also a sense of opportunity. An interesting observation found in many interviews is that

firms declare that joining the CTA is perceived as necessary as “*the most important companies of the region were joining*”. The following quotation reflects the importance of visibility and strategic positioning:

“CTA was like the “club” that allowed you to enter in the domain of R&D. It was expected that this corporation was to aggregate the most relevant firms. The feeling was that if your firm wanted to be considered as innovative, somehow your firm had to be part of this arrangement”.

The second reason for joining is related to access to funding. The aim of some firms is to improve the availability of economic resources for R&D activities. This motivation is generally associated to a good opinion about the CTA’s funding scheme, considered as easy and effective. The types of firms expressing this specific reason are mostly technology-based firms (TBFs) and university spin-offs. For them the CTA is not only interesting for obtaining cross sector relationships, but for accessing to other funding schemes both nationally and internationally.

Although the amount of money to become a member is relevant for these firms, CTA is interpreted as a kind of seed that put the firm in a better position to compete in the EU Framework Program and the national R&D scheme for public-private consortia. Other related motivations are the possibilities for learning and improving R&D skills, especially through the project evaluation process performed by the CTA, and the access to services offered by CTA related to information about external funding schemes.

5.2. What are the components of the process that facilitate collaboration and prevent competition?

a) Collaboration between firms

The basic criterion to choose an industrial partner is the existence of certain relationships, which can be of any kind ranging from commercial activities to personal links. This criterion is closely related with the existence of trust and positive expectations about the partner.

The second criterion copes with partner’s capabilities, specifically the existence of complementary technological skills and business objectives related to a particular research project and its tasks. When firms choose a partner to collaborate in a project funded by the CTA, they usually select the more adequate in terms of skills and interests within their social network. Very often all of the partners are affiliated to the CTA, which reflects the capacity of the corporation to integrate firms with complementary interests.

Regarding the obstacles related to inter-firm collaboration, many of the interviewed managers declare that the more important one is related to knowledge management. Their concern is the risk of unwilling internal know-how from their organization to the partners. This problem is strongly related with the further commercialization of the research outputs and the issue of intellectual property rights.

However, firms mention some good practices implemented to tackle successfully with this problem, for example:

- Stipulation of a transparent collaborative agreement, specifically concerning definition of the research objectives and distribution of tasks and rewards
- Choosing an industrial partner which belongs to the social network of the firm,
- Choosing an industrial partner which has complementary business objectives, and avoiding industrial partners with overlapping strategies.

Industrial managers declare that these practices have a positive effect for preventing the potential struggles between partners in term of knowledge management and commercialization of research outputs. They provide a better control of expectations and contribute to generate trust among partners.

It is important to highlight that the corporation is considered as an arrangement to prevent the competition of partners with overlapping commercial activities. A usual goal is to find the adequate partners along a value chain.

Other practices usually found in CTA that have a positive effect on collaboration are the definition of an evaluation plan of the project, the organization of periodical meeting between the partners and the monitoring of the research activities.

b) Collaboration between firms and academic research groups

Firms usually choose their academic partners according to social and geographical proximity. The university groups engaged in the projects are part of their social network and are also at close distance. The motivation is reducing the transaction costs of the collaboration. Firms recognize the very important role played by the so called “boundary spanners” for building close relationships, for example old university colleagues or “academic champions” in the firm.

In addition to the easy access, firms try to identify partners based on the capabilities of the research group in relation to the specific project. Only when firms lack of close relationships, they use other channels for choosing the partners, as CVs, bibliography, indirect contacts and TTOs.

Regarding obstacles, many industry managers declare the existence of a strong organizational cultural divide between firms and universities. This obstacle is fraught with many practical problems during the performance of the collaboration, especially referring to:

- Accomplishment of the deadlines of the project
- Understanding of the industrial needs
- Lack of vision about application of research outputs

The most relevant divergence is found in technology SMEs, especially the ones who do not have financial capacity. In order to survive, these firms need to be closer to the market. They are not able to engage with university teams that do not have an applied orientation and a strong commitment with the firm goal. The following paragraph illustrates this kind of conflict:

“The main problem is to make university understand that we do not carry out academic projects. A usual conflict for firms is that researchers reach to a simplified product related to market demand, or the opposite, a very complex process with diverse hypothesis. When facing the real market, these results are not worth for a firm. University researchers provide good ideas, but very often they reach only to halfway. The main struggle is that they have to understand that the useful results have to be closer to the market”.

Regarding the factors that facilitate cooperation, the most important one is the existence of a previous relationship with the research group. This provides information in order to oversee results and avoid transactions costs. These situations also required trust between the university team and the firm. Trust is required in order to be able to foreseen possible applications, as the following paragraph suggests:

“We know a lot of things about the university group: their infrastructures, the labs, the capacities of the people. We also know what they are doing, and the developments they are carrying out. This is because there is a relationship based on trust between the research team and the firm. We keep collaborating because the relationship is fluid, and because we feel good with it.”

A different situation if when cooperation occurs among new partners. A good strategy to manage the divide is overseeing the characteristics of the research group, using indirect sources of information as opinions of a third part, bibliography and previous results. In these cases the CTA appears as a good engine for signalling possible partners.

Finally, some industrial managers mention that a very important factor for facilitating cooperative relationships is the intermediary role played by new TBFs that often arise from an academic organization. They

are relevant actors in filling the cultural gap between science and industry by connecting different cognitive perspectives. An effective way to facilitate contacts with university teams was to open CTA to university spin-offs, even when they lacked financial and organizational capacities. The following paragraph reflects how they function as a key chain to access university researchers:

“We work very often with firms that are university spin-offs. They are very useful for engaging university researchers. The academic world is so closed. Their relationships and modus operandi are mediated by colleagues. People participating in these firms are closer to them. In our particular case, having contact with spin-offs has allowed to soften the collaboration with university groups. They have been the lubricant...”

5.3. What are the results that the partners are obtaining?

a) Use of services provided by the CTA

The service most widely used by firms is project funding. Projects are the very *raison d'être* for participating. With funding provided by CTA firms are able to maintain their research agendas and promote new ones. Cooperation is a recombination of resources already invested with new resources to promote innovation. Here we haven't found significant differences among individual projects or consortiums: firms perceive both channels as important. They use each of them according to their needs and the availability of useful social relationships.

Other services frequently used are the participation in sectorial committees, workshops and seminars. They provide opportunities to establish new relationships and access to new sources of information about technology and research trends.

The assistance to compete in calls for R&D projects from other funding programs is used by a reduced group of firms. Generally firms evaluate positively this opportunity, but not all of them are able to take advantage of it. Finally, the less used service of CTA is support for licensing patents and registration of new ones. Only some firms have used this service and most of them give it little relevance to IPR services.

b) Research Outputs

Generally, firms declare a high level of satisfaction about research outputs from project funded by CTA. Nevertheless, only in a few cases research results appears to have generated a marketable product or service. Firms get research capabilities and useful information for commercial strategies, although commercial exploitation of research output seems to be strongly influenced by further research project and developments (and also through new collaborations that are carried out outside CTA).

It is interesting to highlight that firms prefer inter-firm cooperation for further developments, but without academic collaboration. Academic collaboration is considered an important input for getting capabilities at early stages, as reflected in the following quotation:

“Thanks to the CTA projects we have taken the first steps to develop a concept and a first prototype. Now we have in the market some products whose ancestors were CTA projects. Afterward we continued with these projects through private collaboration, and with our own financial resources. That was the way to reach the market”.

The above preference has to do with the types of outputs associated to the more traditional productive sectors, such as construction, energy, food and agriculture. The most frequent outputs in these sectors are new conceptual schemes, prototypes and technical developments. Only in a few cases firms have generated innovative results closely linked to a marketable process or product.

Research outputs from technology-intensive sectors often need further developments for their application. Although these sectors are more prone about patenting, only in some cases firms declared to have patented some technical development. The main reasons for patenting are not to market codified knowledge, but mainly to protect their know how from further competence from other firms. In addition, firms declare a weak interest in patenting as a research output because of the high costs and the scarce probabilities of economic returns.

c) Impact assessment

The impact assessment of a sample of projects provides a closer look at the results. The answers to a set of 24 items grouped in five dimensions are presented in Fig.1.[§] Overall, the most valued dimension is the contribution to the strategy of the firm, followed by the counterfactual estimation of additional benefits. Other important result is related to social responsibility, while results related to marketable products and creation of new firms are less valued.

The most valued items are the following:

- Level of investments in Andalusia (3,51)
- Improvement of strategic orientation (3,24)
- Formation of Human Resources (3, 04)
- Additional funding for research (2,94)

Other items that have received a good evaluation are “increase of prestige” (2,81), “generation of new knowledge” (2,79), “leadership in new research issues” (2,76) and “better professionalization in R&D activities” (2,71). These results suggest that the projects funded by the Corporation have a positive effect on firm’s innovation, also from a regional policy point of view: participation in the CTA affects positively the strategies and capabilities of the firm, at the same time that provide more funding to spend in R&D activities within the regional innovation system.

Regarding economic returns, firms generally agree about the convenience to participate, mainly because of the returns in terms of image, networking and improvement of firm’s R&D capabilities. Nevertheless, firms underline the difficulties to quantify benefits and estimate economical returns of research because most of the products and processes haven’t been introduced in the market. However, most of the firms declare that, in a hypothetical cost-benefit analysis, participation has been a profitable choice.

d) Satisfaction and criticism about participation

Most of the firms declare a strong level of satisfaction about the functioning of the Corporation. The most appreciated features are the following:

- Strong participation of firms in Corporation’s Advisory Board
- The project funding schemes easy and guarantee access to more public support
- High quality of the external evaluation process of the projects
- Good capabilities and level of engagement of CTA staff
- High commitment for network building and fostering regional R&D culture

Most of the participating firms declare that this is in an adequate social and organizational setting for fostering R&D and innovative capabilities.

The main criticism is not related to the functioning, but to the limits of the organizational arrangement. CTA has a strong regional orientation. Most of the firms are regional firms. In addition, many important firms of the

[§] The maximum value of each item is 5 and the minimum is 1.

region are located in the main metropolitan area (Seville), which leads to a concentration of partners from this area.

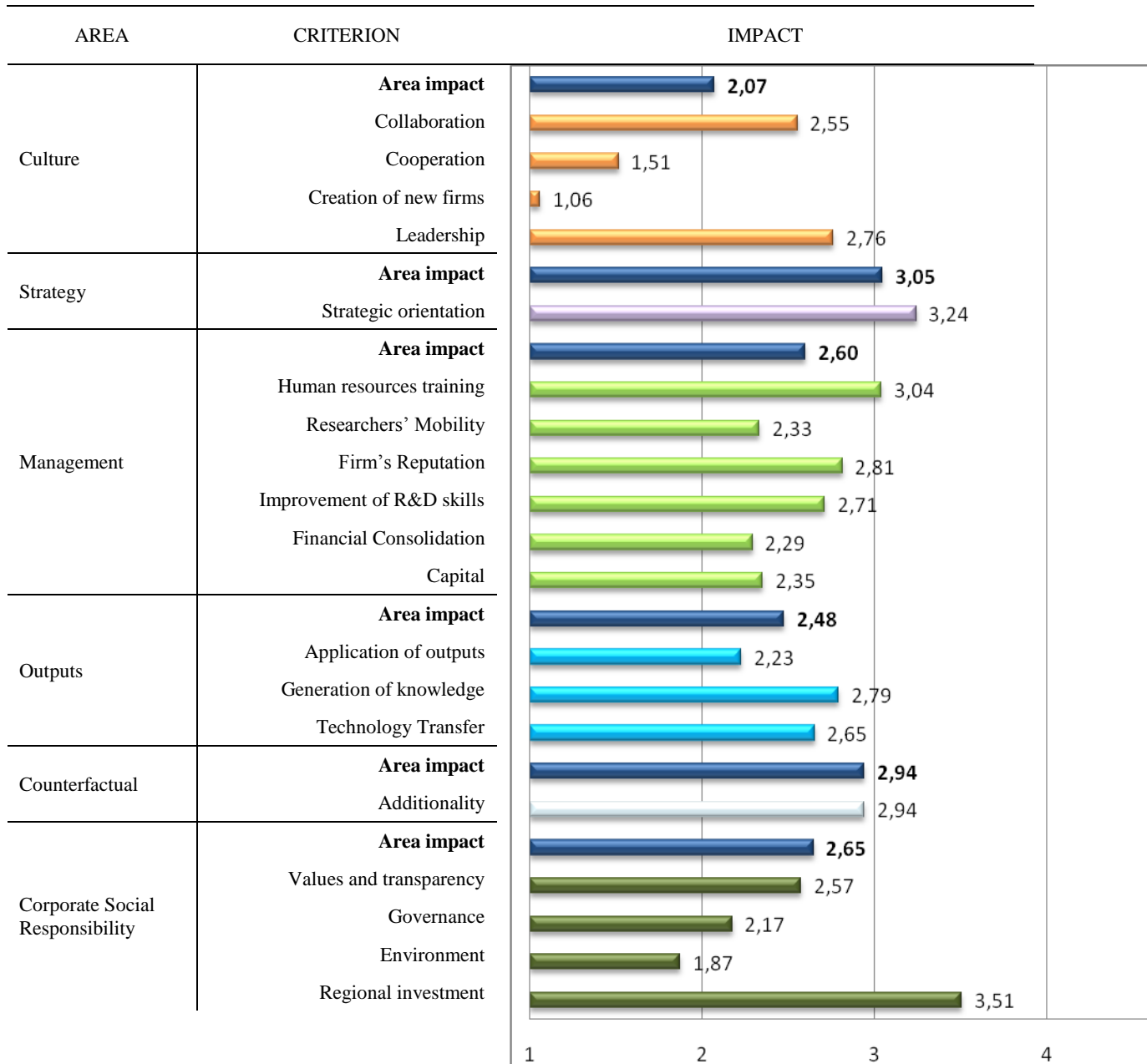


Fig.1. Impact of projects funded by CTA on firms' performance. Source: Internal impact study, CTA (2011)

Some firms ask for a wider scope of CTA's activities and more support for the international promotion of their research collaborative projects. Firms observe that the aim of the Corporation related to foster regional R&D

culture and innovation is limited when facing global positioning. Other suggestion is related to the promotion of activities beyond Seville -the regional Capital City-. Given that projects are directed to participating partners, this may implies some difficulties for accessing both industrial and academic partners in others parts of the region.

Finally, an important issue is related to the distribution of the fees that firms are paying the corporation. Nevertheless, we haven't found negative experiences because in the long term firms usually get more resources than the invested amount.

5.4. *Would the collaboration be sustainable and economically viable without the public support?*

This is the most difficult question since we are facing a counterfactual argument. The results of the survey show that, without the funding provided by the CTA, 82% of the projects would have been performed with a reduced scope or not performed (see Fig.2).

Only some of the interviewed firms declare that they would have performed some of their R&D projects without the support of the Corporation, in cooperation with the public research groups if necessary. These are the cases where R&D is part of the core business of the firm. Although the funding provided by the CTA does not appear as a necessary condition for these firms, it has allowed increasing their budgets for R&D projects.

Finally, considering a hypothetical loss of public support to the budget of the CTA, all firms agree that would be necessary to restructure the Corporation's advisory board and reorganize its mechanisms and funding channels toward more market oriented activities. Many of them also declared that the model could not be effective without public support. This is related to the precompetitive nature of the activities supported to the CTA in relation to the firm market capabilities

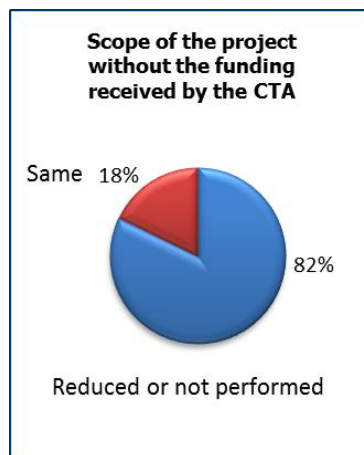


Fig.2. Impact of CTA's funding on the scope of firm R&D projects Source: Internal impact study, CTA (2011)

5.5. *Summary*

CTA's model may be considered as a relevant example of innovative arrangement adapted to the context of a peripheral region, dedicated to the following three main tasks:

- Increasing the R&D activities of the firms
- Promoting cooperative R&D in the region
- Building a social R&D network between firms and universities
- Increasing institutional social capital as by-product of the participation in CTA

The most important characteristics appears to be his private legal form (private foundation with public and private support) and the composition of his advisory board. This guarantees the orientation of funding toward applied R&D projects. In addition, the use of an external evaluation scheme guarantees scientific competence of research activities.

The compulsory subcontracting of university groups as a part of project funding is a mechanism to mobilize public R&D resources toward innovation and to provide some resources to universities. At the same time, the associative nature of the Corporation seems to foster more cooperative dynamics among firms.

Despite the outcomes obtained, two critical problems have been identified in the analysis, regarding the collaborative process: the frequent lack of trust among partners and the difficult process of engaging university researchers in the absence of previous contacts and people who act as boundary spanners. The design of the partnerships for each project, the presence of university spin offs and the availability of services for establishing new relationships, seem to be the mechanisms to overcome the problems mentioned just above.

Finally, referring to the regional impact of the Corporation, we have found three main challenges:

- Improving R&D in regional traditional sectors (as for example food and tourism)
- Extending his presence in the whole region, and counterbalance the disproportionate presence of firms from the main metropolitan area
- Extending the scope to partners outside the region

However, these challenges seem to exceed the current goal of the Corporation.

6. Conclusions and policy implications

The CTA experience shows some interesting features for the study of TH models and cooperative research in peripheral regions. First, the CTA has been more successful than expected regarding the private funding and the number of partners. Although originally was intended as an experimental tool and focused on bigger companies, it has been growing since its launching because the demand from companies inside and outside the region to be part of the Corporation, especially small companies. This can be interpreted as counter intuitive since the fees do not guarantee economic returns or the control of the funded activities, in contrast with other traditional relationships that firms can maintain with universities, such as R&D contracts.

The main reason is that this organizational innovation has become an engine for both collaboration and for getting additional funding.

Second, the CTA encompasses a diversified set of firms that show some interest for opportunity business, including firms in sectors related to R&D and investors, but also many firms that usually do not participate in other structures such as CRC, firms in traditional manufacturing or services. Nevertheless, the nature of the activities has resulted in a profile of firms that have capacities to engage in precompetitive R&D. This arrangement does not seem so be suitable for many firms in the region that work in traditional sectors: these firms engage with universities mainly for services and consultancy, and not for R&D.

Third, the CTA can be considered as an “incubator” of cooperative research that tries to break the linear model procedures usually implemented by regional policies. It shows the functioning of traditional tools, such as projects, but also the process of creating more stable arrangements that are different than the ones found inside universities.

Finally, the findings of the case study show the limits of innovation policies to engage partners with different cognitive capacities, such as universities and big firms on the one side, and SMEs on the other. They also show the difficulties for collaboration between companies that can be competitors.

References

- [1] Etzkowitz, H. & Klofsten, M. (2005). The innovating region: toward a theory of knowledge-based regional development. *R&D Management*, 35, 3, 243-255.

- [2] Gray, D. (2000): Government-sponsored university-industry cooperative research: an analysis of cooperative research centres evaluation approaches. *Research Evaluation*, 9, 567-67.
- [3] Turpin, T., Garrett-Jones, S. & Woolley, R. (2011). Cross-sector research collaboration in Australia: the Cooperative Research Centres Program at the crossroads. *Science and Public Policy*, 38, 87-97.
- [4] Turpin, T. & Fernández-Esquinas, M. (2011). Introduction to special issue: The policy rationale for cross-sector research collaboration and contemporary consequences. *Science and Public Policy* 38, 82-86.
- [5] Arnold, E., Deuten, J. & van Giessel, J.F. (2004). *An international review of Competence Centre Programmes*. Brighton, UK: Technopolis Group.
- [6] Olazaran, M., Albizu, E. & Otero, B. (2009). Technology transfer, technology centres and SMEs: evidence from the Basque Country. *European Planning Studies*, 17, 345-363.
- [7] Audretsch, D. & Keilbach, M. (2007). The localisation of entrepreneurship capital: Evidence from Germany. *Regional Science*, 86, 351–365.
- [8] Carayannis, E.G., & Alexander, J. (1999). Winning by Co-Opeting in Strategic Government-University-Industry R&D Partnerships: The Power of Complex, Dynamic Knowledge Networks. *The Journal of Technology Transfer*, 24, 197-210.
- [9] Powell, W.W. & Grodal, S. (2007). Networks of innovators. In Fagerberg, J., Mowery, D. & Nelson, R. (Eds.), *The Oxford Handbook of Innovation* (pp. 56-85). Oxford: Oxford University Press.
- [10] Maskell P. (2000). Social Capital, Innovation and Competitiveness. In Baron S., Field J., and Schuller T., et al., (eds), *Social Capital: Critical Perspectives* (pp. 111-123). Oxford University Press: New York, Oxford.
- [11] Liyanage, S. (1995). Breeding innovation clusters through collaborative research networks. *Technovation*, 15, 553-567.
- [12] Karamanos, A.G. (2012). Leveraging micro- and macro-structures of embeddedness in alliance networks for exploratory innovation in biotechnology. *R&D Management*, 42, 71-89.
- [13] Burt, R. (2005): *Brokerage and Closure*. Oxford: Oxford University Press.
- [14] White, H. (1981). Where do markets come from?. *American Journal of Sociology*, 87, 517-547.
- [15] White, H. (2002). *Markets from Networks. Socioeconomics Models of Production*. Princeton: Princeton University Press.
- [16] Hewitt-Dundas, N., & Roper, S. (2011). Creating advantage in peripheral regions: The role of publicly funded R&D centres. *Research Policy*, 40, 832-841.
- [17] Burawoy, M. (2009): *The Extended Case Method*. University of California Press.